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Tiffany Allen, Esq.
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Ms. Allen,

This report is in response to your request for my toxicology opinion regarding a proposal for the Philadelphia Police Department to rely solely on urine testing rather than their current policy utilizing hair and urine testing.

I have previously provided you a report dated 8/17/20, specifically addressing hair and urine drug test results for Ms. Kennedy. Ms. Kennedy had a hair drug test result which was confirmed positive for the THC metabolite, THC carboxylic acid. In addition, Ms. Kennedy had two urine drug test results that were reported “negative” and you had asked for my clinical toxicology opinion regarding these test results.

You have now provided me a Microsoft Excel spreadsheet with hair and urine drug test results from the Department over the years 2014-2019. The data represented 2394 simultaneously collected hair and urine specimens tested between 2014 and 2019. These tests were performed on 1452 unique individuals, with several individuals being tested multiple times. I understand that these test results are only for the approximately 10% of testing events where both a hair and urine specimen were collected simultaneously.

The data includes the paired hair and urine drug test results for the various testing event categories, for the various drugs tested, and the MRO determinations or dispositions of the positive test results. On its face, the data contained in the provided spreadsheet is informative about the extent of drug use identified through testing, the prevalence of positive test results for individual drugs, and the rates of positive test results for hair and urine testing. With regards to the specific policy question of relying solely on urine drug testing, the spreadsheet data clearly indicates that hair testing has yielded more positive test results than urinalysis and similarly for almost every drug testing category. After my review of the spreadsheet data, I make the following principal observations:

- More positive test results were obtained through hair testing than through urinalysis (81 vs. 50) even though urine testing had a larger drug test menu. When considering results for matching test menus, hair testing yielded 81 positives vs. 33 for urinalysis.
- In the testing of 1452 individuals, hair testing identified 63 individuals (4.34%) as positive, while urine testing identified 42 individuals (2.89%) as positive. When considering results for matching test menus, hair testing identified 63 individuals (4.34%) as positive while urine testing identified 26 individuals (1.79%) as positive.
- For the illicit drugs: marijuana, cocaine and Ecstasy (MDMA), eight positive results were obtained through hair testing while only one positive result was obtained through urine testing.
- For most testing categories, hair testing obtained more positive results than urine testing.
- The data provides no valid basis to support the elimination of hair testing and relying solely on urine testing.

Thus, the data provided would not support any conclusion by the Department that relying solely on urinalysis testing would be an appropriate shift from their current policy. From the most basic statistic of the overall number of positive test results by each specimen, hair testing clearly yielded more test positive results. I would also argue that hair testing is more likely to identify repeated use of drugs and thus donors who present a greater risk than those who may test positive on a single limited occasion through urine drug testing.

Hair testing vs. urinalysis

In my previous report dated 8/17/20 specific to Ms. Kennedy's test results, I addressed distinctions between urinalysis and hair drug testing.

It should be noted that the laboratory analytical techniques utilized in the analysis of both of these specimens are well-established and robust: i.e. an initial immunoassay followed by confirmation of any positive results utilizing chromatography coupled with mass spectrometry.

At issue is the relative effectiveness (sensitivity, specificity and overall accuracy) of these two specimens in identifying drug use.

Urinalysis

Because urine drug tests generally identify drug use only over the few-day period prior to the specimen collection, unless urine testing is performed quite frequently, occasions of drug use are easily missed. The probability of identifying drug use through urinalysis has been the subject of two peer-reviewed articles examining the effects of the frequency of drug use, the period of detection after use, and the frequency of testing events.

R. Crosby et al., Simulation of drug use and urine screening patterns, *J. Addict. Dis.*, 22 (3), 89 (2003).

R. Dupont et al., Random drug tests at work: The probability of identifying frequent and infrequent users of illicit drugs, *J. Addict. Dis.*, 14 (3), 1 (1995).

These studies demonstrate that the probability of identifying the occasional drug user through urinalysis is quite low, even if the urinalyses are performed frequently. Of course, implementing a random urine drug testing program provides some degree of deterrence when a user will not know when he or she may be tested or how often. But random hair testing also provides deterrence as well. That said, absent very frequent urine testing, with its associated procedural challenges as well as costs, urinalysis cannot be considered as a stand-alone substitute for a program that incorporates the benefits of both urine and hair drug testing.

Urine testing does have a benefit in reasonable suspicion testing events where the suspicions of very recent drug use are more likely to be detected in a urine test than a hair test.

Hair testing

The benefits of hair drug testing are the long window of detection covered by a conventional hair test, i.e. typically about three months, but of course depending on the length of hair being tested. So unlike urinalysis with only a two- or three-day detection window for most drugs, a single hair test has the capability of identifying drug use over an extended three-month period, not three-day period. That said, a limitation of conventional hair testing is that the occasional one- or two-time use of drugs may not yield a positive hair test result. But a repeated or regular drug use should be readily detected through conventional hair testing. It can be argued that the regular and repeat drug user creates a greater risk to the Department than a one-time or occasional user. That is not to say that a one-time or occasional user does not also create a risk, but the one-time or occasional use may be difficult to identify with hair testing as well as with urine testing that is not performed very frequently.

Summary.

I do not find a proposal to rely solely on urinalysis to be a suitable substitute for the Department's current program which takes advantage of the benefits of both types of testing. The Department's spreadsheet data provided clearly demonstrates greater detection sensitivity for hair testing than urinalysis. Of course, it is important for any policy decision-making, that the Department understand the relative strengths and limitations of each testing method available, including procedural issues and associated costs. No one testing technology practically implemented will identify every instance of drug use. I suggest that relying solely on urinalysis will come with reduced overall sensitivity to detect drug use, along with procedural issues and costs at the testing frequency necessary to be effective.

I am prepared to respond to any questions.

A handwritten signature in black ink that reads "Leo Kadehjian". The signature is written in a cursive, slightly slanted style.

Dr. Leo Kadehjian